REMARKS

Present Status of the Application

The Office Action mailed August 13, 2001, rejected all claims 1-5. Specifically, the Office Action objected to the specification. The Office Action further rejected claim 1 under 35 U.S.C. 112, first paragraph, and rejected claims 2-4 under 35 U.S.C. 112, second paragraph. In addition, the Office Action also rejected claim 5 under 35 U.S.C. 102(b) as being anticipated by Kang et al. (U.S. Pat. 5,755,281). The Office Action also rejected claims 2-4 under 35. U.S.C. 103(a) as being unpatentable over Yokoyama (U.S. Pat. No. 6,227,289).

Applicants have amended specification above to overcome the objection. Applicants have also amended claims 1 and 2-4 to overcome the rejection under 35 U.S.C. 112, first and second paragraphs, respectively. In addition, Applicants have canceled claim 5. Applicants respectfully submit that no new matter is added by way of these amendments. After entry of the foregoing amendments, claims 1-4 remain pending in the present application, and reconsideration of those claims is respectfully requested.

Summary of Applicants' Invention

Applicants' invention is directed to a heat exchanger in which high heat transfer efficiency has been attained by optimizing the slit array and setting an optimum range for the width of a slit and the spacing between slits. Slits 51 and 52 formed in front of the heat transfer coil 4 and slits 55 and 56 formed behind said heat transfer coil are arranged so as to provide a

mutually different length among adjoining partitioned slits in the vertical direction, as well as a mutually different length between directly opposite partitioned slits in the horizontal direction. As a result, the position at which the slit is partitioned is staggered. The two slits 53 and 54 formed side by side between heat transfer coil 4 and heat transfer coil 4 are of the same length. For a 7 mm diameter heat transfer coil, the slit width relative to the diameter of the heat transfer coil ranges from 1.2/7 (approximately 0.17) to 2.0/7 (approximately 0.29), and the slit spacing relative to the diameter of the heat transfer coil ranges from 1.3/7 (approximately 0.18) to 3.5/7 (approximately 0.5).

Discussion of Office Action Rejections

The Office Action objected to the specification. The Office Action stated that "a cut profile of each of the two slits ...is parallel to the air flow" in claims 2-5 is not described in the specification. The Office Action also mentioned that the Fig. 5 discloses the claimed subjected matter. Applicants have amended the specification to add the claimed subject matter according features showing in Fig. 5. In addition, the Office Action stated that "there is a mutually different length in a direction perpendicular to the air flow" in claims 2-4 is not described in the specification. Because the claimed subject matter is shown in Figs. 1 and 5, Applicants have amended the specification above according to Figs. 1 and 5 to add the claimed subject matter. Applicants respectfully submit that no new matter is added by way of these amendments. After amending the specification, the objection to the specification should be overcome and withdrawn.

The Office Action further rejected 1 under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification. The examiner stated that N equal to or less than 6 is not described in the specification. In response, Applicants have amended claim 1 to delete " N is equal to or less than 6, and therefore overcome the rejection under 35 U.S.C. 112, first paragraph.

The Office Action rejected claims 2-4 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. The examiner states that "mutually different length" is not understood. In response, Applicants have amended claims 2-4 above, and therefore to overcome the rejection under 35 U.S.C. 112, second paragraph.

Turning now to the substantive rejection, the Office Action rejected claim 2-4 under 35 U.S.C. 103(a), as being unpatentable over Yokoyama. In addition, claim 5 was rejected under 35 U.S.C. 102(b) as being anticipated by Kang et. al (Kang, hereinafter). In response, Applicants respectfully traverse the rejections for at least reasons set forth as followings.

Applicants' invention is directed to a heat exchanger. For example, in Fig. 1, slits 51 and 52 formed in front of the heat transfer coil 4 and slits 55 and 56 formed behind said heat transfer coil are arranged so as to provide *a mutually different length among adjoining*

partitioned slits in the vertical direction, as well as a mutually different length between directly opposite partitioned slits in the horizontal direction. The requisite features of independent claims 2-5 in the invention are characterized by features, which are recited immediately as follows:

> 2. A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by ***a configuration in which the width of each slit formed orthogonal to the air flow on each heat transfer fin is set within a range of 0.17 - 0.29 times a diameter of the heat transfer coils,*** wherein ***two slits formed in front of the heat transfer coil each having mutually different lengths*** and ***two slits formed behind said heat transfer coil each having mutually different lengths,*** and ***the slits are perpendicular to the air flow and a cut profile of each of the slits is parallel to the air flow.***
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> 3. A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which the spacing between slits formed on the heat transfer fins is ***set within a range of 0.18 - 0.5 times the diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil each having mutually different lengths and two slits formed behind said heat transfer coil each having mutually different lengths, and the slits are perpendicular to the air flow and a cut profile of each of the slits is parallel to the air flow.***
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> 4. A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which the width of each slit formed on each heat transfer fin is ***set within a range of 0.17 - 0.29 times the diameter of the heat transfer coils, and the spacing between slits formed on the heat transfer fins is set within a range of 0.18 - 0.5***

times the diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil each having mutually different lengths and two slits formed behind said heat transfer coil each having mutually different lengths, and the slits are perpendicular to the air flow and a cut profile of each of the slits is parallel to the air flow.

(*Emphasis added*) Applicants respectfully submit that claimed features contain subject matter emphasized above that is lacked in the prior art.

Claim 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Kang. In response, Applicant has canceled claim 5 above, so that the rejection under 35 U.S.C. 102(b) should be withdrawn.

Claims 2-4 were rejected under 35 U.S.C. 103(a) as being unpatentable over Yokoyama. The Office Action further alleged that width Wf of the slit is equal to 1/3 the spacing Wb between two slits, and the geometrical relationship between the each spacing Wb and the coil diameter is about 0.5. Therefore, the width of the slit is about 0.166 (1/3*1/2) times the coil diameter. In response, Applicant respectfully disagrees the rejection and interpretations for at least reasons set forth as follows.

Regarding the interpretations, Applicants do not agree for following reasons. First, in the present invention, the two partitioned slits are not equal in length. But, in the Yokoyama's disclosure, the two partitioned slits are equal length, as shown in Figs.2, 3A, 4A, 5A and 6A. As

claimed in claims 2-4 of the invention, the present invention clearly states that ***wherein two slits formed in front of the heat transfer coil each having mutually different lengths and two slits formed behind said heat transfer coil each having mutually different lengths.*** This feature is not disclosed by Yokoyama.

In addition, although Yokoyama teaches that width Wf of the slit is equal to 1/3 the spacing Wb between two slits, but is silent about that the geometrical relationship between the each spacing Wb and the coil diameter is about 0.5. The Office Action only states that the geometrical relationship between the each spacing Wb and the coil diameter is about 0.5 in Fig. 4B. Applicants do not agree this rejection. Applicants respectfully submit that the value "0.5" alleged by the examiner is only measured from the drawing. Yokoyama fails to tell how to optimize the relationship between the spacing Wb and the coil diameter. Applicants respectfully emphasis that the rejection cannot be made based on the measurement from the schematic drawing to there render obviousness, which is improper.

Therefore, the structure of the invention is different from Yokoyama and the optimum value is not disclosed by Yokoyama. Namely, claims 2-4 patently define over Yokoyama. For at least the foregoing reasons, Applicants respectfully submit that independent claims 2-4 patently define over the prior art, and should be allowed.

Atty Docket No.: JCLA6244-C1 **Serial No.: 09/611,562**

CONCLUSION

For at least the foregoing reasons, it is believe that all pending claims 1-4 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is hereby invited to telephone the undersigned counsel to arrange for such a conference.

Respectfully submitted,
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ANNOTATED VERSION OF MODIFIED CLAIMS TO SHOW CHANGES MADE

In The Specification

On page 5, beginning at line 17, please replace following clean copy text.

Partitioned slits 51 and 52 formed in front of the heat transfer coil 4 and slits 55 and 56 formed behind said heat transfer coil are arranged so there is a mutually different length among adjoining partitioned slits in the vertical direction, as well as a mutually different length between directly opposite partitioned slits in the horizontal direction. As a result, the position at which the slits are partitioned is staggered. However, slits 53 and 54 formed side by side between heat transfer coil 4 and heat transfer coil 4 are of the same length. In Fig. 5, the partition position 5, 6 are represented by dash lines. Namely, slits 51, 52 and slits 55, 56 are partitioned from one slit at position 5 and 6 respectively. In addition, referring to Figs. 1 and 5, the two slits 51, 52 formed in front of the heat transfer coil 4 each having mutually different lengths, and two slits 55, 56 formed behind said heat transfer coil 4 each having mutually different lengths. The slits 51, 52, 55, 56 are perpendicular to the air flow, and the cut profile at the partition position 5, 6 (in the width direction) of each of the slits is parallel to the air flow.

In The Claim:

Claims 1-4 have been amended as follows:

1. (Third Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration so as to satisfy the correlation expressed by the following numerical formula:

$Ws \geq (1\text{-}0.1\ (6\text{-}N)) \times W_F/(2N+1)$

where, Ws = width of each slit formed on said heat transfer fins, W_F = width of a heat transfer fin, and N = the number of slit arrays formed on said heat transfer fin / number of heat transfer fin units[, and where N is equal to or less than 6].

2. (Third Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which the width of each slit formed orthogonal to the air flow on each heat transfer fin is set within a range of 0.17 - 0.29 times a diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil each having mutually different lengths and two slits formed behind said heat transfer coil each having mutually different lengths, and the slits are perpendicular to the air flow and a cut profile of each of the slits is parallel to the air flow [wherein two slits formed in front of the heat transfer coil and two

slits formed behind said heat transfer coil are arranged so there is a mutually different length in a direction perpendicular to the air flow, and wherein].

3. (Third Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which the spacing between slits formed on the heat transfer fins is set within a range of 0.18 - 0.5 times the diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil each having mutually different lengths and two slits formed behind said heat transfer coil each having mutually different lengths, and the slits are perpendicular to the air flow and a cut profile of each of the slits is parallel to the air flow [wherein two slits formed in front of the heat transfer coil and two slits formed behind said heat transfer coil are arranged so there is a mutually different length in a direction perpendicular to the air flow, and wherein a cut profile of each of the two slits formed in front of the heat transfer coil and the two slits formed behind said heat transfer coil is parallel to the air flow].

4. (Third Amended) A heat exchanger in which heat transfer coils penetrate through a row of multiple plate-shaped heat transfer fins set at a specified fin pitch, and slits are formed on each plate-shaped heat transfer fin, and in which air is supplied orthogonally to said heat transfer coils, characterized by a configuration in which the width of each slit formed on each heat

transfer fin is set within a range of 0.17 - 0.29 times the diameter of the heat transfer coils, and the spacing between slits formed on the heat transfer fins is set within a range of 0.18 - 0.5 times the diameter of the heat transfer coils, wherein two slits formed in front of the heat transfer coil each having mutually different lengths and two slits formed behind said heat transfer coil each having mutually different lengths, and the slits are perpendicular to the air flow and a cut profile of each of the slits is parallel to the air flow [wherein two slits formed in front of the heat transfer coil and two slits formed behind said heat transfer coil are arranged so there is a mutually different length in a direction perpendicular to the air flow, and wherein a cut profile of each of the two slits formed in front of the heat transfer coil and the two slits formed behind said heat transfer coil is parallel to the air flow].

Claim 5 has been canceled without prejudice and disclaimer.